

at least one hawser having a first end operatively coupled to the tank and a second end adapted to be accessible from the water surface and attachable to the tanker to anchor the tanker during offtake operations.

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### REMARKS

Applicants thank the Examiner for his careful examination of the application. In view of the above amendments and the following remarks, favorable reconsideration of the application is respectfully requested.

#### Disposition of the Claims:

Claims 1-29 are pending in the application. Claim 30 has been added. Claims 1, 27, and 30 are independent claims. Claims 12 and 23 have been amended to clarify Applicants' invention. No new matter has been added by way of the amendments.

#### Claim Rejections under 35 U.S.C. § 112:

Claims 12-16, and 23 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 12 and 23 have been amended to clarify Applicants' invention. To the extent that the rejection may apply to the amended claims, the rejection is respectfully traversed.

Claim 12, and claims 13-16 depending therefrom, were rejected as unclear for reciting "the subsurface buoyant device is located at a depth below the water surface substantially unaffected by waves and surface currents..." The Examiner has stated that it is unclear whether this means the device is unaffected, or whether there are no wave effects at that depth. Applicants submits that the language of claim 12 would be clear to one of ordinary skill in the art in view of the specification. However, for the purpose of clarity, Applicants have amended claim 12 to recite "the subsurface buoyant device is located at a depth below the water surface such that the subsurface buoyant device is substantially unaffected by waves and surface currents..."

Claim 23 was rejected as unclear for reciting "atmospheric pressure vessel" when the specification recites that in one embodiment the tank comprises a pressure balanced tank. Applicants submit that it would be clear to one of ordinary skill in the art in view of the specification that a pressure vessel considered to be an atmospheric pressure vessel may be used

for embodiments of the invention. However, for the sake of clarity, Applicants' have amended the specification to recite that the tank is "a pressure balanced vessel."

Because claims 12-16 and 23, as amended, clearly point out and distinctly claim the subject matter which the Applicants regard as their invention, withdrawal of the rejection is respectfully requested.

**Claim Rejections under 35 U.S.C. § 102:**

Claims 1, 2, 3, 4, and 22 were rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 3,865,653 ("Hix"). This rejection is respectfully traversed.

In one embodiment, the Applicants invention relates to a system for storing and retrieving liquid hydrocarbons, such as oil, in a tank located on a seabed. As recited in independent claim 1, the system includes a storage tank attachable to the seabed and adapted to store hydrocarbons therein. The system also includes at least one fluid channel having a first end positioned inside the tank proximal the bottom of the tank, and a second end in fluid communication with seawater outside of the tank. The system further includes at least one offload line having a first end coupled to and in fluid communication with the tank proximal a top of the tank and a second end adapted to be fluid coupled to a tanker and accessible from a water surface. The system further includes at least one hawser having a first end operatively coupled to the tank and a second end adapted to be accessible from the water surface and attachable to a tanker to anchor the tanker during offload operations.

The present invention advantageously provides storage for offshore production so that quantities of hydrocarbons can be continually produced during adverse weather conditions independent of the availability of a tanker. In some embodiments, the present invention may be used to eliminate the need for costly deepwater pipelines. In addition, the present invention may provide a large storage capacity system which is less complex and lower in cost to operate and maintain relative to prior art storage systems. In one aspect, the cost savings may be realized because thin walled vessels may be used in conjunction with the present invention, which is possible because the system is in fluid communication with seawater outside of the tank.

Hix relates only to an underwater storage device. In particular, Hix teaches the attachment of an underwater storage tank to a seabed such that it is less susceptible to damages resulting from earthquakes or high waves than previous seabed storage tanks. (Hix, col. 1, ll. 25-29; col. 3, ll. 5-9). In reviewing Hix, Applicants respectfully point out that Hix fails to disclose

or suggest several of the features recited in claim 1. In particular, Hix fails to disclose or suggest "at least one offload line having a first end coupled to and in fluid communication with the tank proximal a top of the tank and a second end adapted to be fluid coupled to a tanker and accessible from a water surface." In fact, the term tanker does not appear anywhere in the disclosure of Hix. Hix also fails to teach or suggest the accessibility of any line from the water surface. Further, Applicants point out that the Examiner has not identified any disclosure in Hix that corresponds to this element of the Applicants' claim.

Additionally, Applicants point out that Hix fails to disclose or suggest "at least one hawser..." as recited in claim 1. Hix is completely absent any teaching or suggestion of a tanker or anchoring a tanker to a storage tank. Further, Hix is completely silent with regard to offtake operations. Applicants respectfully point out that the line 26 in Hix, noted by the Examiner in the rejection, is not a hawser. Rather, Hix discloses (col. 2, ll. 9-13) 26 is a plurality of flexible cables 26 for anchoring the storage tank to the seabed. Clearly, cables for anchoring a storage tank to the seabed fail to render obvious "a hawser ... attachable to a tanker to anchor the tanker during offtake operations" as recited in claim 1.

Because Hix fails to disclose or suggest at least one offload line and at least one hawser as claimed in claim 1, Hix clearly fails to anticipate or render obvious the invention as recited in claim 1. Accordingly, withdrawal of the § 102 rejection of claim 1 is respectfully requested. Claims 2-4 and 22, which depend from claim 1, are likewise patentable over Hix for at least these reasons.

#### **Claim Rejections under 35 U.S.C. § 103:**

##### **A. Manning & Hix**

Claims 1-12, 17-22, and 24-26 were rejected as being obvious over U.S. Patent No. 3,479,673 ("Manning") in view of Hix. This rejection is respectfully traversed.

Manning discloses a loading boom pivotally mounted to a floating terminal for the mooring and loading of a tanker. In particular, Manning discloses a boom or support means extending part way between a floating terminal and a tanker to facilitate the tanker being moored at a safe distance from the terminal while being in fluid communication therewith. According to Manning, the floating terminal is large enough such that personnel can be supported on the upper end of the floatation tank (64) (col. 6, ll. 2-3) and electrical equipment, pumps, and controls, associated with the bottom-mounted satellite gathering system can be supported on the terminal

(col. 7, ll. 21-25). Manning also discloses transferring hydrocarbons to and from a submerged tank through a "fluid transportation leg 60 of the boom 56" (Manning, col. 5, line 58). The entire disclosure of Manning relates to this large, rigid, complex mooring system through which hydrocarbons can flow. As noted above, Hix only discloses a storage tank. Hix is completely silent as to an offload line or a mooring system.

In contrast, claim 1 of the Applicants' invention recites "at least one offload line having a first end coupled to and in fluid communication with the tank proximal a top of the tank and a second end adapted to be fluid coupled to a tanker and accessible from the water surface." The present invention as disclosed and claimed provides an improvement over the apparatus disclosed by Manning, because it is a simpler, more cost effective, and a less environmentally hazardous system for transferring hydrocarbons at the ocean surface. In particular, the present invention advantageously eliminates the need for the large surface structure taught by Manning, thereby providing a substantial improvement under adverse weather conditions.

Because the entire disclosure of Manning relates to a large, rigid, complex floating terminal and "boom" structure and Hix provides no teaching that would lead to any modification of the offtake or mooring system taught by Manning, the present invention (which has no such structure) cannot be rendered obvious by Manning in view of Hix. Further, removal of the boom structure taught by Manning would render Manning unsuitable for its intended purpose, and one of ordinary skill in the art would have no motivation to combine and/or modify the teaching of Manning in view of Hix to obtain an offtake or mooring system as recited in independent claim 1.

Additionally, Applicants' claim 1 recites "at least one hawser having a first end operatively coupled to the tank and a second end adapted to be accessible from the water surface and attachable to the tanker to anchor the tanker during offtake operations." Again, both Manning and Hix are completely silent as to this limitation in claim 1. As noted above, Manning relates to a large, rigid, and complex boom structure that may be lowered and rotated into a given position and a tanker can be connected thereto. Manning discloses that the boom structure includes a mooring bollard and a line from the tanker can be attached to the bollard (col. 3, ll. 31-37). Mooring does not disclose or suggest providing a hawser coupled to a submerged tank and attachable to a tanker as recited in Applicants' claim 1.

Further, because the boom structure taught by Manning is a large structure located on the ocean surface, it could easily be damaged by high winds and/or waves found at the surface of the ocean during adverse weather conditions. In contrast, the majority of the Applicant's offshore system is located beneath the surface of the ocean to significantly reduce the chance of damage by wind and/or waves. The simplistic structure and significant advantages of Applicants' invention over that of Manning are not rendered obvious by Manning in view of Hix.

Accordingly, because the combination of Manning and Hix fails to show or suggest all of the features of claim 1 and fails to render obvious significant advantages associated with Applicants' invention, claim 1 is patentable over their combined teachings. Claims 2-12, 17-22, and 24-26, which depend from claim 1, are likewise patentable for at least the same reasons. Accordingly, withdrawal of the rejection is respectfully requested.

#### **B. Manning, Hix, & Braud**

Claims 13-16 were rejected under 35 U.S.C. § 103 as being obvious over Manning and Hix in view of U.S. Patent No. 5,816,183 (Braud). This rejection is respectfully traversed.

Braud relates to Catenary Anchor Leg Mooring (CALM) buoy that comprises a body with buoyancy and means for connecting the buoyant body to catenary anchor chains to anchor the body to the seabed. As discussed in section A above, neither Manning nor Hix discloses or suggests all of the features of claim 1. Braud fails to overcome the deficiencies noted in the combination of Manning and Hix. Accordingly, claims 13-16, which depend from claim 1, are patentable over the combination of Manning, Hix, and Braud for at least the same reasons as claim 1. Accordingly, withdrawal of the § 103 rejection of claims 13-16 is respectfully requested.

#### **C. Manning, Hix, and Phelps**

Claim 23 was rejected under 35 U.S.C. § 103 as being obvious over Manning and Hix in view of U.S. Patent No. 3,645,415 ("Phelps"). This rejection is respectfully traversed.

Phelps relates to the storage of liquids at atmospheric pressure. As noted in part A above, the combination of Manning and Hix fails to show or suggest all of the features recited in claim 1. Phelps fails to overcome the deficiencies noted in the combination of Manning and Hix discussed in section A above. Additionally, the advantages provided by embodiments of Applicants' invention would not be obvious in view of this combination. Accordingly, claim 23, which depends from claim 1, is patentable over the combination of Manning, Hix, and Phelps for

at least the same reasons as claim 1. Accordingly, withdrawal of the § 103 rejection of claim 23 is respectfully requested.

**D. Hix and Anderson**

Claims 27-29 were rejected under 35 U.S.C. § 103 as being obvious over Hix in view of U.S. Patent No. 4,273,066 (Anderson). This rejection is respectfully traversed.

As noted above, Applicants' invention relates to a system for storing and retrieving liquid hydrocarbons, such as oil, in a tank located on a seabed. As recited in independent claim 27, the system includes a storage tank, at least one fluid channel, a tensioned riser, a subsurface buoy, a flexible hose, at least one hawser, a surface buoy, at least one coupling device, and weighting material.

As stated above, Hix discloses only a storage tank. Hix is completely silent with regard to offtake operations or transferring hydrocarbons to tankers. Applicants respectfully point out that Hix does not disclose "a connection to the surface 38" as stated by the Examiner. Rather, Hix discloses that connection 38 is provided at the top of the tank to permit withdrawal of oil from the tank. (Hix, col. 2, ll. 45-47). Further, Hix shows connection 38 as completely submerged in water (Figure 5). Additionally, Hix fails to disclose or suggest that any connection or line from the tank extends to the surface or is accessible at the surface. Rather Hix focuses on methods for attaching a submerged tank to a seabed.

Anderson relates to a method for mooring a surface vessel and delivering oil directly to the surface vessel from an offshore oil well. Anderson does not show or suggest submerged storage tanks attached to a seabed. In view of the non-analogous teachings of Anderson and Hix, Applicants can see no line of reasoning, and the Examiner has presented none, as to why one of ordinary skill in the art would combined or modify the teachings of Anderson in view of Hix without the benefit of Applicants' claims as a guide.

However, Applicants point out that both Hix and Anderson fail to show or suggest several of the features claimed in independent claim 27. For example, both Hix and Anderson fail to show or suggest "a tensioned riser in fluid communication with [a] tank, the riser having a first end coupled to the tank proximal a top of the tank, the riser extending therefrom to a second end at a selected depth below the water surface, the riser coupled proximal the second end to a subsurface buoy to maintain the riser in tension." As stated above, although Hix teaches a storage tank with an oil outlet, Hix is completely silent as to the distal end of the oil outlet.

Further, Hix fails to disclose or suggest having a riser with a second end at a selected depth below the water surface or coupling a riser to a subsurface buoy to maintain a riser in tension. Anderson fails to disclose or suggest a storage tank on the seabed or having a riser attached to a storage tank as recited in claim 27. Rather Anderson teaches a mooring system having a base 30 attached to the seabed and a riser attached to the base.

Additionally, Hix fails to disclose or suggest at least a flexible hose, a surface buoy device, accessibility from the water surface, an end of a hose adapted to fluid couple to a tanker, at least one hawser, one end of a hawser adapted to attach to a tanker to moor the tanker, or a coupling device as claimed in independent claim 27 of the instant application. Further, Anderson fails to disclose or suggest at least a storage tank, a fluid channel, a tension riser, a coupling device, and a weighting material as claimed in independent claim 27. Accordingly, neither Hix nor Anderson, whether taken singly or combined, renders obvious the invention as claimed in claim 27. Further, one of ordinary skill in the art would have no motivation to combined the teachings of Hix and Anderson without the benefit of the Applicant's claims as a guide. Accordingly, claim 27 and claims 28-29, which depend from claim 27, are patentable over Hix in view of Anderson for at least the reasons noted above. Accordingly, withdrawal of the § 103 rejection of claims 27-29 is respectfully requested.

**Newly Added Claim:**

Claim 30 has been newly added to the application. Claim 30 is similar in scope to claim 1 except that the limitation of at least one fluid channel as been deleted to clarify that in accordance with the invention as disclosed and claimed, the storage tank may be an open bottom tank or a closed bottom tank. In view of the above discussion regarding the allowability of claim 1 over the combination of Hix and Manning, claim 30 is patentable for at least the same reasons. That is, neither Hix nor Manning disclose or suggest "at least one offload line..." or "at least one hawser..." as recited in claim 30. Accordingly, claim 30 is patentable over the prior art.

**Concluding Remarks:**

Applicants believe this reply to be completely responsive to all outstanding issues and to place the application in condition for allowance. Accordingly, a favorable action in the form of a Notice of Allowance is respectfully requested.

Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 06558.011001).

Respectfully submitted,

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Marked-Up Version of Claims

IN THE CLAIMS:

12. (Amended) The system of claim 6, wherein the subsurface buoyant device is located at a depth below the water surface such that the subsurface buoyant device is substantially unaffected by waves and surface currents [less than waves and surface currents of] produced by a selected storm magnitude.

23. (Amended) The system of claim 1, wherein the storage tank is [an atmospheric] a pressure balanced vessel having a box-shaped configuration with a web-framed steel structure.